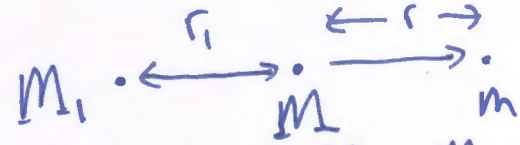
219(4) : General Superposition of orbits is a Plane

In general the orbit of the earth is a superposition of its orbit about the sun, and the sun's orbit about the centre of the Milky Way galaxy. In a first approximation, consider the two orbits taking place in the same plane:



Here m is the mass of the earth, M the mass of the sun and M_1 the mass at the centre of the Milky Way. The two orbits are:

$$r = \frac{\alpha}{1 + \epsilon \cos(x\theta)} \quad -(1)$$

and

$$r_1 = \frac{\alpha_1}{1 + \epsilon_1 \cos(x_1 \theta)} \quad -(2)$$

Also vector sum is:

$$\underline{R} = \underline{r} + \underline{r}_1 \quad -(3)$$

so

$$R = (r^2 + r_1^2)^{1/2} \quad -(4)$$

in general. Plot R versus θ.

Here:

$$\alpha = \frac{L^2}{mk}, \quad \epsilon = \left(1 + \frac{2EL^2}{mk^2}\right)^{1/2}, \quad k = mMG \quad -(5)$$

$$\alpha_1 = \frac{L_1^2}{m_1 k}, \quad \epsilon = \left(1 + \frac{2E_1 L_1^2}{m_1 k_1^2}\right)^{1/2}, \quad k_1 = m_1 M G \quad -(6)$$